22. SITE SELECTION

SITING ASSESSMENT

A two-step siting assessment process was undertaken in considering locations for the proposed facility. The first step of the siting process was initiated concurrent with discussions among the scientific personnel aimed at determining operational and research associations between the proposed building and other research activities at the Laboratory. In the initial or first pass assessment, sites that might physically accommodate this new building were identified. Possible sites were identified on the main Laboratory site, on lands immediately to the east of the Laboratory site, and in the neighboring cities of Richmond and Alameda (sites within a 15-mile radius of the Laboratory). Each of these sites was then evaluated as to their ability to accommodate the facility. All but four of the first-step sites were eliminated. Most were eliminated as essential utilities were not available in the general area or because the local jurisdiction had already made other plans for the site, and a number of the sites were eliminated as upon closer review they could not accommodate a building of the required size. The sites identified and considered in this phase are illustrated in Figure 22-1.

Four sites advanced for further consideration in the second phase; two on the Laboratory site and two at the University of California's Richmond Field Station. Each of the four sites were found to be feasible during this second phase review, however, in the end not all sites were ranked equally. One site, the Building 51 site, was not the top recommended site as a large former accelerator building remains on this site and this large structure is not scheduled to be demolished in a timeframe consistent with that preferred for the ultrafast dynamics facility. It was determined that acceleration of the demolition process would add approximately $40M to the cost of this project. The two sites in the City of Richmond are not the top recommended site as the research community determined that there are both scientific and operational benefits which would be lost in selecting a site approximately 15-30 minutes travel time from the Laboratory site. Moreover, it was determined that these sites would also require specially engineered foundations to ensure proper stability of the beam line floor. These two sites are adjacent to liquefaction zones and are on a sandy loam that carries vibration waves from adjacent railroad and industrial operations.

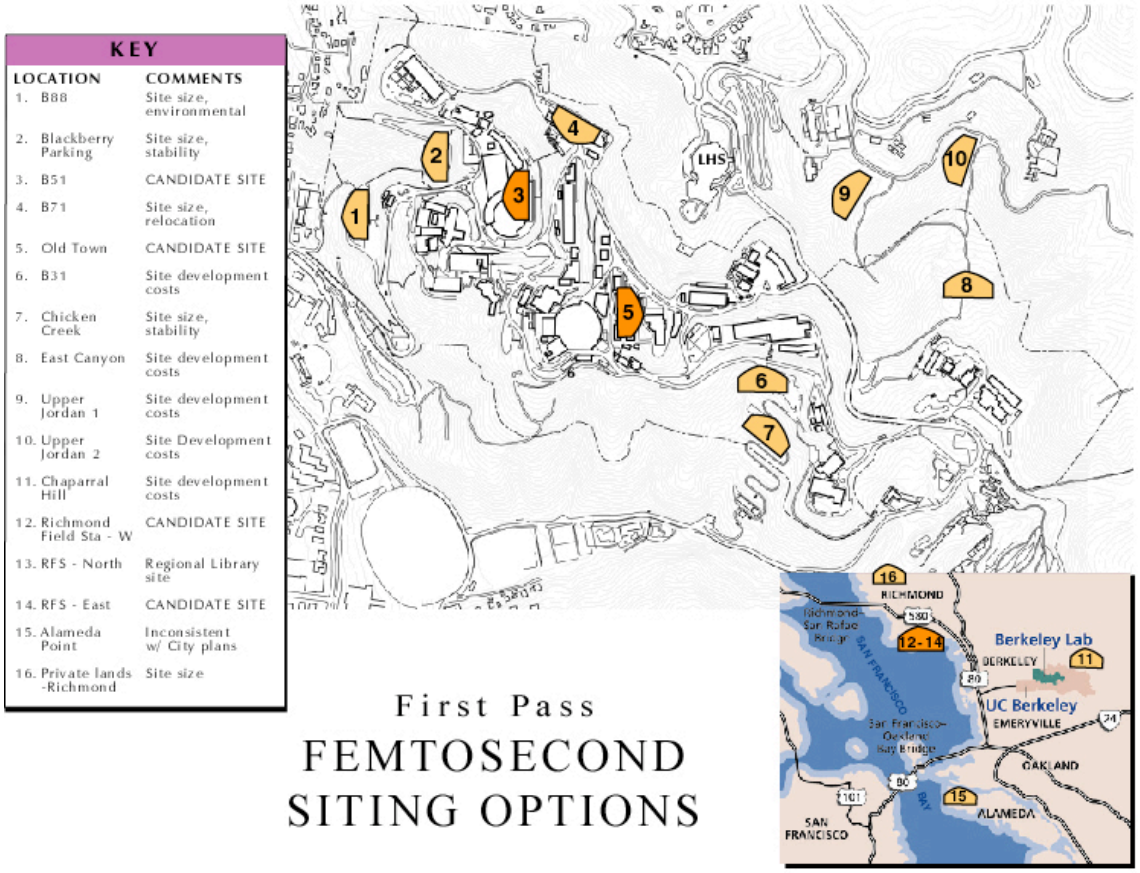

Figure 22-1 First pass sitting options

Highest Ranked Site

The highest ranked site for the proposed facility is immediately to the east of the Advanced Light Source (ALS). This site is in the *Old Town* area of Berkeley Lab (see Figure 22-2 below) and is currently occupied by a number of small buildings. The four primary factors driving this recommendation are summarized below:

Scientific and operational relationships with the ALS. Both the ALS and the proposed femtosecond dynamics facility are x-ray light sources dedicated to user experiments. The ALS and the femtosecond dynamics facility provide opportunities to conduct different but synergistically related research. An enclosed pedestrian bridge could link the femtosecond dynamics facility building with the ALS and facilitate both cross-disciplinary collaboration of users and efficient staffing of both facilities. Provision may be made for possible future beamline and end-station integration between the two facilities.

Utility Infrastructure. The proposed site is adjacent to a recently upgraded electrical substation with capacity to meet the needs of this facility as well as other future growth requirements of the Laboratory. The Laboratory obtains federal power via this substation.

Stable Geology. The proposed site requires little excavation to reach stable bedrock. This site provides superior building stability, an important factor as beamline stability and alignment are paramount issues in the operation of this facility.

Site Renewal. The proposed *Old Town* site currently contains a number of small and difficult to effectively utilize W.W. II-era buildings. These buildings have provided over 50-years of scientific service but no longer meet modern building codes or scientific research standards. Moreover, these buildings can not be cost-effectively upgraded to serve modern science and in general they are expensive to maintain in even a minimal operating condition. Thus siting at this location removes structures that are operational liabilities and replaces them with facilities fully capable of supporting the next generation of scientific research.

At this site, the building design can take advantage of a gently sloped topography. Excavation costs will be moderate. Moreover, there are design benefits as well. The experimental floor of the proposed building would be directly accessible from the adjacent road (Segre Road), while the upper floor offices and laboratories would be made directly accessible from another road (Road "R"). The main entrance to the upper level will be from a parking lot adjacent to a significant grove of redwood trees. The main lobby, entered from the upper road, will be located on a mid-level with an elevator and stair connection to both first and second floors.

The project is sited in conformance with Berkeley Lab's Long-Range Development Plan (LRDP); this LRDP foresaw and supports redevelopment of this site.

The Laboratory Site Remediation office conducted a review of sub-surface contamination records in the project area. This study concluded that scientific buildings such as those proposed are fully permissible at this location. It was also determined that standard precautions would be required for the identified contaminants. In general, the contamination is low-level and is generally a considerable distance below the proposed foundation elevation of the new building. A small-contaminated groundwater plume to the east (which is already being managed) can be controlled using standard technologies. Small and localized areas of soil contamination may exist under the foundations of some of the still standing buildings, we recommend a sampling program for these areas prior to excavation and removal of soil. The report also notes that an updated risk-assessment may be required if the design of the building varies considerably from the assumptions that are at the basis of the current risk assessment.

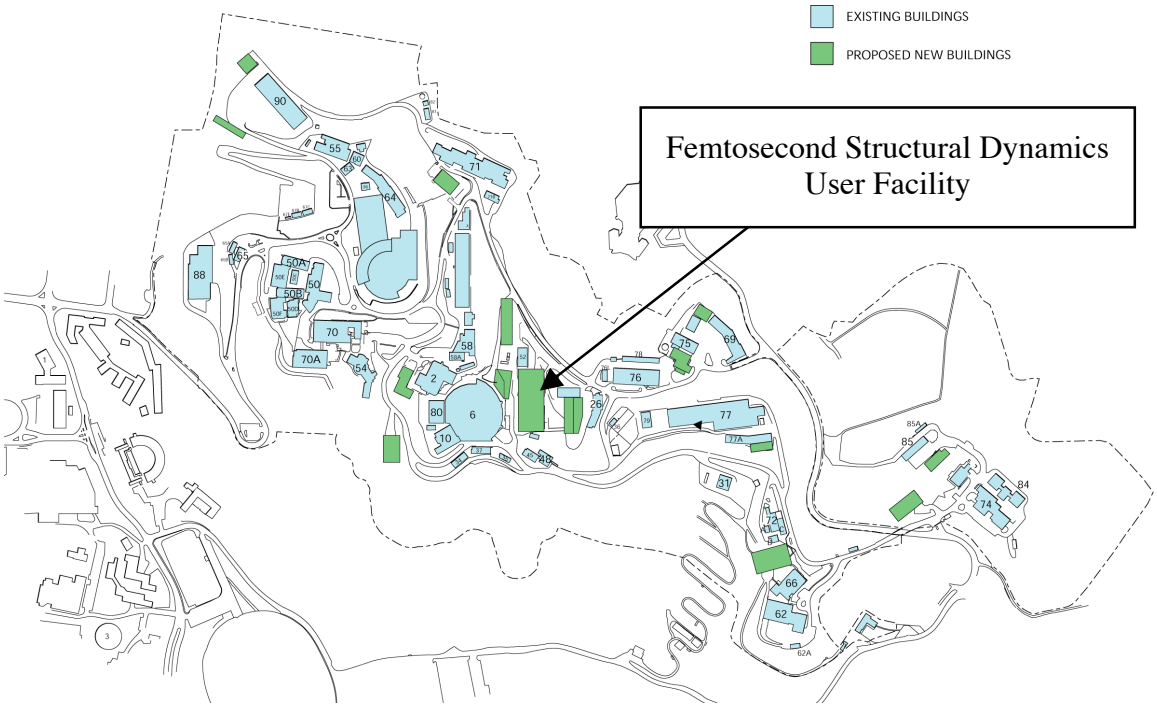

Figure 22-2 Top ranked location for a femtosecond dynamics facility at Berkeley Lab. The Advanced Light Source is the round building (6) immediately to the left of this femtosecond dynamics facility site.

Groundwater Contamination

The proposed accelerator site (*Old Town* or OT site) lies above a broad multi-lobed plume of groundwater contamination known as the Old Town Plume. Contaminants detected in groundwater are primarily halogenated non-aromatic volatile organic compounds(VOCs) (primarily industrial solvents [perchloroethene {aka tetrachloroethene} [PCE], trichloroethane [TCA], carbon tetrachloride], solvent degradation products [dichloroethene [DCE], dichloroethane [DCA], vinyl chloride, chloroform, etc], or both [trichloroethene [TCE]]). and lesser quantities of fuel hydrocarbons (diesel/kerosene and crude/waste oil).

Groundwater flow directions and maximum recorded groundwater elevations in the vicinity of the OT site have been determined; groundwater flow is northwestwards in the northern part, and southwestwards in the southern part of the site. The depth to groundwater varies considerably due to the differing hydraulic properties of the rocks beneath different parts of the site. The lobes of the Old Town Plume comprise several subplumes derived from multiple sources, which, primarily as a result of groundwater movement, have commingled to form the larger area of groundwater contamination. As a result, contaminated groundwater generally containing tens to hundreds of μg/L (commonly referred to as parts-per-billion [ppb]) underlies most of the OT site. Following is a description of each lobe of the plume.

- The Building 7 lobe of the Old Town Plume contains the highest levels of contamination and has a principal contaminant source (the Building 7 sump) north of Building 7. This lobe lies

entirely downgradient from the OT site (i.e. flow within the plume is away from the site), so is largely irrelevant to site development plans.

- The Building 52 lobe has substantially lower contaminant concentrations than the Building 7 lobe, but immediately underlies the northern part of the OT site. However, groundwater lies at a significantly greater depth than the expected foundation depth for the proposed accelerator, so no direct foundation to groundwater contact would occur.
- The Building 25A lobe also has relatively low contaminant concentrations compared to the Building 7 lobe. However, flow within this lobe is westward towards the center of the OT site, and recently a groundwater collection trench has been installed south of Building 44 to limit further westward migration of contaminated water. Analysis based on information from wells in the area shows that the groundwater highstand elevation (i.e. the highest recorded groundwater elevation) in this lobe intersects the OT site building footprint, indicating the potential for groundwater seepage into the excavation and contact between the building foundation and contaminated groundwater. However, it should be noted that the groundwater elevation as measured reflects the rise of groundwater into wells that have screens located below the elevation of the proposed building foundation, and, given the low permeability of rocks in this area, does not indicate that groundwater would in fact flow into the building foundation excavation. Insufficient data are currently available to evaluate whether or not groundwater seepage would occur into the excavation.

Development of the OT site would need to include mitigation of the following groundwater contamination impacts:

- Protection of construction workers from potential direct groundwater exposure while excavating the eastern portion of the foundation
- Capture, treatment and disposal of contaminated groundwater (if encountered) both during construction and after completion of the building
- Assessment and mitigation of toxic vapors that might migrate from groundwater through the soil into overlying buildings or into the excavation.

Generally, protection of construction workers would be assured through preparation of a construction risk management plan that included site monitoring and contingency plans. If groundwater was encountered during construction, capture and treatment would likely involve installation of extraction wells, sumps, or trenches, and construction of a temporary treatment system. It is likely that building subdrains (if needed) would need to be constructed as remediation systems to capture all groundwater that could potentially contact building foundations, and discharge it to a groundwater treatment system. The rainwater collection system for the building would need to be constructed so as to ensure that rainwater effluent was not mixed with groundwater in the subdrain system. A similar mitigation measure is currently employed at Building 46, where the previously existing subdrain has been adapted to capture the downgradient edge of the Building 52 lobe.

Human Health Assessment

A human health risk assessment is currently in progress as part of Berkeley Lab's RCRA Corrective Measures Study. Preliminary results indicate that risks to building occupants at the OT site from vapor migration are generally below thresholds of concern (e.g. incremental risks less than 10^{-6}) except for a very small area at the north end of the site. However, these results are based on the assumption of buildings located at the current ground surface and groundwater contamination remains at the present level. Since the Old Town site would apparently involve an unusually large excavation, the depths to groundwater beneath the building would decrease substantially from those utilized in the risk assessment, thus increasing risks. On the other hand, the recently completed Building 25 Corrective Measure may lower the level of contamination in groundwater over the next few years. Therefore, it would be necessary to reevaluate risks based on the proposed building design and the future groundwater contamination level, probably through a combination of modeling and vapor sampling. In the event that risks were shown to be significant, it is likely that regulatory agencies would require building construction modifications (e.g. vapor barriers beneath foundations, and possibly a continued monitoring plan) to mitigate potential risks.

Soil Contamination

Soil contamination associated with a number of historic sources exists within the proposed accelerator site. These include:

- PCBs and petroleum hydrocarbons at Area of Concern (AOC) 10-2, the former Building 52 hazardous materials storage area. Low levels of these contaminants are present in shallow soil (primarily <5 feet) in areas immediately adjacent to Building 52.
- PCBs, petroleum hydrocarbons and some metals at Solid Waste Management Unit (SWMU) 10-4, the Building 16 Former Waste Accumulation Area. Low levels of these contaminants were present in shallow soil on the slope west of Building 16.

Other soil contaminants are present at scattered locations at the OT site, but at levels less than regulatory cleanup standards for the site, and would not be triggers for construction or office worker protection measures. However, waste management regulations would effect disposal of such soils as wastes. Therefore, a soil management plan would need to be developed that including provisions for sampling, analysis, waste profiling, transportation and disposal of waste soil.

Given the long history of multiple uses of the OT site, it would be prudent to conduct sampling of currently inaccessible soil beneath buildings as they were demolished, with analyses conducted based on historical building use patterns. Proposed sampling scope and procedures could be included in the soil management plan discussed above.